CLAIMS

The invention claimed is:

1. A stripline signal processing module comprising:

a first planar dielectric substrate defining an edge;

a second planar dielectric substrate defining an edge;

a ground plane;

the first dielectric substrate, the second dielectric substrate, and the ground plane adhered together in an overlaying configuration with the ground plane located between the first and second dielectric substrates and the edges aligned to form an interface edge;

a first stripline circuit carried on the first dielectric substrate;

a second stripline circuit carried on the second dielectric substrate;

one or more input ports located at the interface edge and electrically connected to the first or second stripline circuits;

one or more output ports located at the interface edge and electrically connected to the first or second stripline circuits; and

the first and second stripline circuits configured to receive propagating signals at the input ports, perform a signal processing operation on the received propagating signals, and deliver processed signals to the output ports.

2. The stripline signal processing module of claim 1, wherein:

the first dielectric substrate, the second dielectric substrate, and the ground plane are approximately coextensive in their planar dimensions; and

the first and second stripline circuits comprise stripline exposed to the dielectric substrate on one side and exposed to air or a dielectric material on an opposing side.

3. The stripline signal processing module of claim 1, further comprising one or more electrical connections between the first and second stripline circuits.

4. The stripline signal processing module of claim 3, wherein the electrical connections between the first and second stripline circuits comprise tap-through connectors passing through and insulated from the ground plane.

5. The stripline signal processing module of claim 1, wherein the first and second stripline circuits are non-crossing.

6. The stripline signal processing module of claim 4, wherein:

the first stripline circuit defines a first stage orthogonal beam forming network;

the second stripline circuit defines a second stage orthogonal beam forming network; and

the electrical connections between the first and second stripline circuits participate in the formation of crossovers connecting the first and second stage orthogonal beam forming network into a multi-stage orthogonal beam forming network.

7. The stripline signal processing module of claim 6, wherein the multi-stage orthogonal beam forming network is selected from the group consisting essentially of:

a two-by-four beam steering circuit;

a diplexer filter circuit comprising at least three ports;

a three-by-three Butler matrix circuit;

a four-by-four Butler matrix circuit;

an eight-by-eight Butler matrix circuit;

a four-by-four monopulse comparator circuit;

an eight-by-eight monopulse comparator circuit.

8. The stripline signal processing module of claim 3, wherein:

the first and second stripline circuits define non-crossing portions of a hybrid junction circuit; and

the electrical connections between the first and second stripline circuits participate in the implementation of one or more crossovers associated with the hybrid junction circuit.

9. The stripline signal processing module of claim 1, wherein the first and second stripline circuits define a network selected from the group consisting essentially of an beam forming network, and an analog amplifier.

10. The stripline signal processing module of claim 1, wherein the first or second stripline circuits comprises one or more sinuous trace legs configured to exhibit a desired phase and impedance characteristic while reducing the displacement of the trace in a selected dimension.

11. The beam forming network of claim 1, wherein:

the first and second stripline circuits comprise a four-by-four Butler matrix circuit configured for a carrier frequency; and

the planar dimensions of the first dielectric substrate, the second dielectric substrate, and the ground plane are less than one and one-half times the wavelength of the carrier frequency in the stripline.

12. The stripline signal processing module of claim 1, wherein:

the first and second stripline circuits comprise a four-by-four Butler matrix circuit configured for a carrier frequency; and

the planar dimensions of the first dielectric substrate, the second dielectric substrate, and the ground plane include:

a length in the direction of the interface edge that is less than one and one-half times the wavelength of the carrier frequency in the stripline, and

a width perpendicular to the interface edge that is less than one-half times the wavelength of the carrier frequency in the stripline.

13. The stripline signal processing module of claim 1, wherein:

the first and second stripline circuits comprise a four-by-four Butler matrix circuit configured for a carrier frequency; and

the planar dimensions of the first dielectric substrate, the second dielectric substrate, and the ground plane include:

a length in the direction of the interface edge that is approximately equal to the wavelength of the carrier frequency in the stripline, and

a width perpendicular to the interface edge that is approximately one-fourth times the wavelength of the carrier frequency in the stripline.

14. A stripline signal processing module comprising:

a first planar dielectric substrate defining an edge;

a second planar dielectric substrate that is approximately coextensive with the first planar dielectric substrate defining an edge;

a ground plane that is approximately coextensive with the first and second planar dielectric substrates;

the first dielectric substrate, the second dielectric substrate, and the ground plane adhered together in an overlaying configuration with the ground plane located between the first and second dielectric substrates and the edges aligned to form a interface edge;

a first stripline circuit exposed to the first dielectric substrate on one side and exposed to air or a dielectric material on an opposing side;

a second stripline circuit exposed to the second dielectric substrate on one side and exposed to air or a dielectric material on an opposing side;

a plurality of input interface ports located at the interface edge and electrically connected to the first stripline circuit;

a plurality of output interface ports located at the interface edge and electrically connected to the second stripline circuit;

one or more tap-through electrical connections between the first and second stripline circuits passing through and insulated from the ground plane electrical connections; and

the first and second stripline circuits configured to receive propagating signals at the input ports, perform a signal processing operation on the received propagating signals, and deliver processed signals to the output ports.

15. The stripline signal processing module of claim 14, wherein:

the first stripline circuit defines a first stage orthogonal beam forming network;

the second stripline circuit defines a second stage orthogonal beam forming network; and

the electrical connections between the first and second stripline circuits participate in the formation of crossovers connecting the first and second stage orthogonal beam forming network into a multi-stage orthogonal beam forming network.

16. The stripline signal processing module of claim 14, wherein the first or second stripline circuits comprises one or more sinuous trace legs configured to exhibit a desired phase and impedance characteristic while reducing the displacement of the trace in a selected dimension.

17. The stripline signal processing module of claim 15, wherein the multi-stage orthogonal beam forming network is selected from the group consisting essentially of:

a two-by-four beam steering circuit;

a diplexer filter circuit comprising at least three ports;

a three-by-three Butler matrix circuit;

a four-by-four Butler matrix circuit;

an eight-by-eight Butler matrix circuit;

a four-by-four monopulse comparator circuit;

an eight-by-eight monopulse comparator circuit.

18. The stripline signal processing module of claim 14, wherein:

the first and second stripline circuits comprise a four-by-four Butler matrix circuit configured for a carrier frequency; and

the planar dimensions of the first dielectric substrate, the second dielectric substrate, and the ground plane are less than one and one-half times the wavelength of the carrier frequency in the stripline.

19. The stripline signal processing module of claim 14, wherein:

the first and second stripline circuits comprise a four-by-four Butler matrix circuit configured for a carrier frequency; and

the planar dimensions of the first dielectric substrate, the second dielectric substrate, and the ground plane include:

a length in the direction of the interface edge that is less than one and one-half times the wavelength of the carrier frequency in the stripline, and

a width perpendicular to the interface edge that is less than one-half times the wavelength of the carrier frequency in the stripline.

20. The stripline signal processing module of claim 14, wherein:

the first and second stripline circuits comprise a four-by-four Butler matrix circuit configured for a carrier frequency; and

the planar dimensions of the first dielectric substrate, the second dielectric substrate, and the ground plane include:

a length in the direction of the interface edge that is approximately equal to the wavelength of the carrier frequency in the stripline, and

a width perpendicular to the interface edge that is approximately one-fourth times the wavelength of the carrier frequency in the stripline.

21. A stripline signal processing network comprising:

a double-sided dielectric substrate board having first and second planar surfaces located on opposing sides of a ground plane;

an interface edge defined by at least one side of the dielectric substrate board;

a first stripline circuit carried on the first planar surface defining a first non-crossing portion of the stripline signal processing network;

a second stripline circuit carried on the second planar surface defining a second non-crossing portion of the stripline signal processing network;

one or more electrical connections between the first and second stripline circuits participating in the formation of a crossover associated with the stripline signal processing network;

one or more input ports and output ports located along the interface edge and electrically connected to the stripline circuits; and

the stripline signal processing network configured to receive propagating signals at the input ports, perform a signal processing operation on the received propagating signals, and deliver processed signals to the output ports.

22. The stripline signal processing network of claim 21, wherein:

the stripline circuits comprise stripline segments having sizes selected to exhibit desired phase and impedance characteristics; and

the electrical connections between the first and second stripline circuits comprise tap-through connectors passing through and insulated from the ground plane.

23. A stripline signal processing network constructed from stripline stripline carried on a dielectric substrate board comprising:

a first portion of the stripline signal processing network located on a first side of a double-sided dielectric substrate board;

a second portion of the stripline signal processing network circuit located on a second side of the double-sided dielectric substrate board;

one or more electrical connections between the first and second portions of the stripline signal processing network;

one or more input ports and output ports located along an interface edge defined by the dielectric substrate board; and

the stripline signal processing network configured to receive propagating signals at the input ports, perform a signal processing operation on the received propagating signals, and deliver processed signals to the output ports.

24. The stripline signal processing network of claim 23, wherein:

the first and second portions of the network are non-crossing; and

the electrical connections between the first and second portions of the network participate in the formation of a crossover associated with the network.

25. A modular stripline signal processing network comprising an interconnected set of network modules, wherein each network module comprises:

a first stripline circuit located on a first side of a double-sided dielectric substrate board;

a second stripline circuit located on a second side of the double-sided dielectric substrate board;

one or more input ports and output ports located along an interface edge defined by the dielectric substrate board; and

the network module configured to receive propagating signals at the input ports, perform a signal processing operation on the received propagating signals, and deliver processed signals to the output ports.

26. The modular stripline signal processing network of claim 25, wherein the interface ports for each network module are edge-connected to another network board through soldered connections.

27. The modular stripline signal processing network of claim 25, wherein the interface ports for each network module are configured for removable edge-connection to another network board through separable connections.

28. The modular stripline signal processing network of claim 27, wherein the separable connections comprise blind-mate coaxial connectors.

29. The modular stripline signal processing network of claim 27, wherein:

each network module implements a lower-order hybrid junction circuit; and

the interconnected set of network modules combines the network modules to implement a higher-order hybrid junction circuit.

30. The modular stripline signal processing network of claim 29, wherein:

each lower-order hybrid junction circuit is selected from the group consisting of a three-by-three, a four-by-four, and an eight-by-eight Butler matrix circuit; and

the higher-order hybrid junction circuit includes at least sixteen input ports and sixteen output ports.

31. The modular stripline signal processing network of claim 25, wherein, for each network module, the electrical connections between the first and second stripline circuits comprise tap-through connectors passing through and insulated from the ground plane.

32. The modular stripline signal processing network of claim 25, wherein, for network module:

the first stripline circuit is non-crossing;

the second stripline circuit is non-crossing; and

the electrical connections between the first and second stripline circuits participate in the formation of a crossover associated with the signal processing network.

33. The modular stripline signal processing network of claim 25, wherein each network module implements a circuit selected from the group consisting essentially of:

a two-by-four beam steering circuit;

a diplexer filter circuit comprising at least three ports;

a three-by-three Butler matrix circuit;

a four-by-four Butler matrix circuit;

an eight-by-eight Butler matrix circuit;

a four-by-four monopulse comparator circuit;

an eight-by-eight monopulse comparator circuit.

34. The modular stripline signal processing network of claim 25, wherein each network module comprises one or more sinuous trace legs configured to exhibit a desired phase and impedance characteristic while reducing the displacement of the trace in a selected dimension.

35. A modular stripline signal processing network comprising an interconnected set of network modules, wherein each network module comprises:

a first planar dielectric substrate defining an edge;

a second planar dielectric substrate defining an edge;

a ground plane;

the first dielectric substrate, the second dielectric substrate, and the ground plane adhered together in an overlaying configuration with the ground plane located between the first and second dielectric substrates and the edges aligned to form an interface edge;

a first stripline circuit carried on the first dielectric substrate;

a second stripline circuit carried on the second dielectric substrate;

one or more electrical connections between the first and second stripline circuits;

one or more input ports located at the interface edge and electrically connected to the first or second stripline circuits;

one or more output ports located at the interface edge and electrically connected to the first or second stripline circuits; and

the first and second stripline circuits configured to receive propagating signals at the input ports, perform a signal processing operation on the received propagating signals, and deliver processed signals to the output ports.

36. The modular stripline signal processing network of claim 35, wherein, for each network module:

the first stripline circuit define a first stage hybrid junction circuit;

the second stripline circuit define a second stage hybrid junction circuit; and

the electrical connections between the first and second stripline circuits participate in the implementation of one or more crossovers interconnecting the first stage and second stage hybrid junctions into a higher-order orthogonal beam forming network.

37. The stripline signal processing network of claim 36, wherein the input and output ports for each beam forming network module are edge-connected to another network board.